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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/812,117	03/29/2004	Richard L. Elliott	2269-6990.2US	7596
24247	7590	08/14/2006	EXAMINER	
TRASK BRITT P.O. BOX 2550 SALT LAKE CITY, UT 84110			NOVACEK, CHRISTY L	
			ART UNIT	PAPER NUMBER
			2822	

DATE MAILED: 08/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/812,117	ELLIOTT ET AL.	
	Examiner	Art Unit	
	Christy L. Novacek	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 July 2006.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12-21 is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

This office action is in response to the request for continued examination filed July 18, 2006 and the amendment filed June 19, 2006.

#### ***Response to Amendment***

The amendment to the specification is sufficient to overcome the objection to the specification stated in the previous office action. Therefore, this objection is withdrawn.

The amendment of claims 6 and 21 are sufficient to overcome the rejection of claims 6 and 21 under 35 U.S.C. 112, second paragraph stated in the previous office action. Therefore, this rejection is withdrawn.

The limitations added to claim 1 are sufficient to overcome the rejections of claims 1-8 and 11 as being anticipated by, or unpatentable over, the Lee et al. (US 5,355,020) reference. Therefore, those rejections are hereby withdrawn.

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 9 and 10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1, as amended, recites the limitation, "the single metal layer substantially

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filling the contact hole and in **physical** contact with the contact surface on the semiconductor substrate.” (emphasis added). However, claim 9, which is dependent upon claim 1, states that there are layers of silicide and refractory metal silicide **in between** the single metal layer and the substrate (claim 1 and claim 9 refer to two different embodiments of Applicant’s invention). Therefore, claim 9 cannot be dependent upon claim 1. Claim 10 is rejected because it is dependent upon claim 9.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, 6 and 11 are rejected under 35 U.S.C. 102(e) as being anticipated by Gofuku (US 6,190,911).

Regarding claim 1, Gofuku discloses forming an insulation layer (110/112) on a semiconductor substrate, forming a contact hole in the insulation layer to expose a contact surface on the substrate, and forming a single layer of metal (113) having a substantially planar top surface upon a top planar surface of the insulation layer (the portion of the insulation layer that is covered by the single layer of metal has a top planar surface), the single layer of metal substantially filling the contact hole and in physical contact with the contact surface on the substrate (Fig. 3K; col. 4, ln. 50 – col. 6, ln. 3).

Regarding claim 2, Gofuku discloses that the single layer of metal may be made of a pure metal or an alloy (col. 4, ln. 40-44; col. 5, ln. 63-67).

Regarding claim 3, Gofuku discloses that the single layer of metal may include aluminum (col. 4, ln. 40-44).

Regarding claim 4, Gofuku discloses that the single layer of metal may be made of AlSi (col. 5, ln. 63-67).

Regarding claim 6, Gofuku discloses that the insulation layer may be made of silicon dioxide (col. 5, ln. 31-36, ln. 57-62).

Regarding claim 11, Gofuku discloses that the single layer of metal is deposited by a PVD process (sputtering) (col. 5, ln. 63-67).

Claims 1, 5 and 6 are rejected under 35 U.S.C. 102(e) as being anticipated by McAnally et al. (US 5,960,304).

Regarding claim 1, McAnally discloses forming an insulation layer (16) on a semiconductor substrate (12), forming a contact hole in the insulation layer to expose a contact surface on the substrate, and forming a single layer of metal (24) having a substantially planar top surface upon a top planar surface of the insulation layer, the single layer of metal substantially filling the contact hole and in physical contact with the contact surface on the substrate (Fig. 1A-1F; col. 2, ln. 43 – col. 4, ln. 22).

Regarding claim 5, McAnally discloses that the insulation layer may be made of BPSG (col. 3, ln. 6-7).

Regarding claim 6, McAnally discloses that the insulation layer may be made of an oxide (col. 3, ln. 6-7).

***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gofuku (US 6,190,911) in view of Lee et al. (US 5,355,020, previously cited) and Sahota (US 5,840,623, previously cited).

Regarding claim 7, Gofuku discloses forming a metal line having a thickness and a selected shape from the single layer of metal, but Gofuku does not disclose planarizing the insulation layer and the single layer of metal. Like Gofuku, Lee discloses forming a metal connection made by depositing an aluminum alloy metal layer into a contact opening in an insulation layer. Lee teaches that the aluminum alloy metal layer should be treated in an environment of a selected pressure range and a selected temperature range so as to cause the single layer of metal to substantially fill the contact hole without forming a void in the metal connection layer (Abstract; col. 10, ln. 57 – col. 11, ln. 62; col. 14, ln. 39 – col. 16, ln. 16). At the time of the invention, it would have been obvious to one of ordinary skill in the art to heat treat the single layer of metal of Gofuku because Lee teaches that by annealing the metal layer, the connection can be formed without a void. Like Gofuku, Sahota discloses forming metallization interconnect structures in an insulation layers. Sahota discloses that it is conventional in the art to planarize the surface of the insulation layer (col. 1, ln. 6-36). At the time of the invention, it would have been obvious to one of ordinary skill in the art to planarize the insulation layer of Gofuku in order to prevent photolithography errors when patterning the contact hole and metal connection.

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Regarding claim 8, Gofuku discloses patterning and etching the single layer of metal into the metal line having the selected shape (col. 5, ln. 63-67).

***Response to Arguments***

Applicant's arguments with respect to claims 1-11 have been considered but are moot in view of the new ground(s) of rejection.

***Allowable Subject Matter***

Claims 12-21 are allowed.

The primary reasons for the allowance of claims 12-21 were stated in the office action mailed December 1, 2005.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christy L. Novacek whose telephone number is (571) 272-1839. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CLN  
August 4, 2006



Michael Trim  
Primary Examiner